

PETER HAEBERLI

BAR ADMISSIONS

Supreme Court of the State of Colorado
Registration Number 037392

Supreme Court of the State of California
Registration Number 800900

United States Patent and Trademark Office
Registration Number 52,980

PROFESSIONAL EXPERIENCE

March 2007-present Merck & Co., Inc.
Managing Assistant Counsel

- Patent Counsel responsible for Merck RNA Therapeutics Program

January 2005-March 2007 Sirna Therapeutics Inc.
Director, Intellectual Property

- Patent Counsel responsible for Sirna intellectual property portfolio

January 2003-January 2005 Sirna Therapeutics Inc.
Associate Director, Intellectual Property

- Developed RNAi based intellectual property platform

January 2001-January 2003 Ribozyme Pharmaceuticals Inc.
Manager, Intellectual Property

- Prepared seminal patents on chemically modified short interfering nucleic acid (siNA) technology

August 1999-January 2001 Ribozyme Pharmaceuticals Inc.
Intellectual Property Liaison

- Acted as liaison between scientific and legal staff for patent preparation and prosecution matters

June 1993-August 1999 Ribozyme Pharmaceuticals Inc.
Research Associate, Organic Chemistry

- Responsible for research and development of chemically modified oligonucleotide therapeutic modalities and delivery systems
- Developed novel synthetic strategies for key nucleic acid based pharmaceutical intermediates
- Designed and synthesized modified nucleic acids for preclinical and clinical programs
- Active in GMP, process development, and basic research applications of nucleic acid chemistry

September 1992-June 1993

Geneva Pharmaceuticals Inc.

Chemist

- Performed analytical research and development activities

Summers 1989-1991

Ciba-Geigy Inc.

Summer Specialist

- Assisted in chemical synthesis and process development activities to support IND filings

EDUCATION

University of Denver Sturm College of Law

J.D., Order of St. Ives, 2005

- GPA 3.7
- Recipient of 7 scholastic excellence awards

University of Colorado, Boulder

B.S., Molecular, Cellular, Developmental Biology, 1992

- GPA 3.5

PUBLICATIONS

1. Haeberli, Peter; Berger, Imre; Pallan, Pradeep S.; Egli, Martin. *Syntheses of 4'-thioribonucleosides and thermodynamic stability and crystal structure of RNA oligomers with incorporated 4'-thiocytosine.* Nucleic Acids Research (2005), 33(13), 3965-3975.
2. Karpeisky, Alexander; Sweedler, David; Haeberli, Peter; Read, Javier; Jarvis, Keith; Beigelman, Leonid. *Scaleable and efficient synthesis of 2'-deoxy-2'-N-phthaloyl nucleoside phosphoramidites for oligonucleotide synthesis.* Bioorganic & Medicinal Chemistry Letters (2002), 12(22), 3345-3347.
3. Radka, Susan F.; Pasko, Christopher; Haeberli, Peter; Beigelman, Leo. *The development of a monoclonal antibody specific for a 2'-C-allyl modification of uridine, and its use in the localization of ribozymes in vivo.* Analytical Biochemistry (2002), 307(1), 40-46.
4. Matulic-Adamic, Jasenka; Serebryany, Vladimir; Haeberli, Peter; Mokler, Victor R.; Beigelman, Leonid. *Synthesis of N-Acetyl-D-galactosamine and Folic Acid Conjugated Ribozymes.* Bioconjugate Chemistry (2002), 13(5), 1071-1078.
5. Matulic-Adamic, Jasenka; Daniher, Andrew T.; Karpeisky, Alexander; Haeberli, Peter; Sweedler, David; Beigelman, Leonid. *Synthesis of modified nucleoside 5'-triphosphates for in vitro selection of catalytic nucleic acids.* Nucleosides, Nucleotides & Nucleic Acids (2001), 20(4-7), 1113-1115.
6. Minasov, George; Matulic-Adamic, Jasenka; Wilds, Christopher J.; Haeberli, Peter; Usman, Nassim; Beigelman, Leonid; Egli, Martin. *Crystal structure of an RNA duplex containing phenyl-ribonucleotides, hydrophobic isosteres of the natural pyrimidines.* RNA (2000), 6(11), 1516-1528.
7. Beigelman, Leonid; Matulic-Adamic, Jasenka; Karpeisky, Alexander; Haeberli, Peter; Sweedler, David. *Base-modified phosphoramidite analogs of pyrimidine ribonucleosides for RNA structure-activity studies.* Methods in Enzymology (2000), 317(RNA-Ligand Interactions, Pt. A), 39-65.
8. Matulic-Adamic, Jasenka; Daniher, Andrew T.; Karpeisky, Alexander; Haeberli, Peter; Sweedler, David; Beigelman, Leonid. *Functionalized nucleoside 5'-triphosphates for in vitro selection of new catalytic ribonucleic acids.* Bioorganic & Medicinal Chemistry Letters (2000), 10(11), 1299-1302.
9. Beigelman, Leonid; Haeberli, Peter; Sweedler, David; Karpeisky, Alexander. *Improved synthetic approaches toward 2'-O-methyl-adenosine and guanosine and their N-acyl derivatives.* Tetrahedron (2000), 56(8), 1047-1056.
10. Gaur, Rajesh K.; Beigelman, Leonid; Haeberli, Peter; Maniatis, Tom. *Role of adenine functional groups in the recognition of the 3'-splice-site AG during the second step of pre-mRNA splicing.* Proceedings of the National Academy of Sciences of the United States of America (2000), 97(1), 115-120.
11. Matulic-Adamic, Jasenka; Haeberli, Peter; Drenzo, Anthony B.; Mokler, Victor R.; Maloney, Lara; Beigelman, Leonid; Usman, Nassim; Wincott, Francine E. *Synthesis and incorporation of 5'-amino- and 5'-mercapto-5'-deoxy-2'-O-methyl nucleosides into hammerhead ribozymes.* Nucleosides & Nucleotides (1997), 16(10 & 11), 1933-1950.
12. Liu, Qiaolian; Green, Justin B.; Khodadadi, Arbi; Haeberli, Peter; Beigelman, Leonid; Pyle, Anna Marie. *Branch-site selection in a group II intron mediated by active recognition of the adenine amino group and steric exclusion of non-adenine functionalities.* Journal of

Molecular Biology (1997), 267(1), 163-171.

13. DiRenzo, Anthony; Grimm, Susan; Levy, Kurt; Haeberli, Peter; Maloney, Lara; Usman, Nassim; Wincott, Francine. *2'-Substituted phosphorothioate containing oligoribonucleotides: an application to the synthesis and purification of hammerhead ribozymes.* Nucleosides & Nucleotides (1996), 15(11 & 12), 1687-1700.
14. Beigelman, Leonid; Karpeisky, Alexander; Matulic-Adamic, Jasenka; Haeberli, Peter; Sweedler, David; Usman, Nassim. Dep. Chem. Biochem., *Synthesis of 2'-modified nucleotides and their incorporation into hammerhead ribozymes.* Nucleic Acids Research (1995), 23(21), 4434-42.
15. Beigelman, Leo; Matulic-Adamic, Jasenka; Haeberli, Peter; Usman, Nassim; Dong, Beihua; Silverman, Robert H.; Khamnei, Shahrzad; Torrence, Paul F. *Synthesis and biological activities of a phosphorodithioate analog of 2',5'-oligoadenylate.* Nucleic Acids Research (1995), 23(19), 3989-94.
16. Matulic-Adamic, Jasenka; Haeberli, Peter; Usman, Nassim. *Synthesis of 5'-Deoxy-5'-Difluoromethyl Phosphonate Nucleotide Analogs.* Journal of Organic Chemistry (1995), 60(8), 2563-9.

PATENTS AND PATENT APPLICATIONS

1. McSwiggen, James; Beigelman, Leonid; Usman, Nassim; Haeberli, Peter; Chowrira, Bharat; Polisky, Barry. *RNA interference-mediated inhibition of mitogen-activated protein kinase gene expression or expression of genes involved in MAP kinase pathway using short interfering nucleic acids.* U.S. Pat. Appl. Publ. (2006), US 2006127891.
2. Haeberli, Peter; Beigelman, Leonid. *Modified short interfering nucleic acids with reduced immunostimulatory activity for RNA interference-mediated inhibition of gene expression.* U.S. Pat. Appl. Publ. (2005), US 2005282188.
3. McSwiggen, James; Chowrira, Bharat M.; Haeberli, Peter; Beigelman, Leonid; Usman, Nassim. *RNA interference-mediated inhibition of MAP kinase p38 gene expression using short interfering nucleic acid (siNA).* U.S. Pat. Appl. Publ. (2005), US 2005239731.
4. Vargeese, Chandra; Wang, Weimin; Chen, Tongqian; Sweedler, David; Haeberli, Peter. (Sirna Therapeutics, Inc., USA). *Polycationic compositions for cellular delivery of polynucleotides.* U.S. Pat. Appl. Publ. (2005), US 20050222064.
5. Morrissey, David; Haeberli, Peter. (Sirna Therapeutics, Inc., USA). *Nucleic acid mediated inhibition of cytolytic toxin activity and uses thereof for diagnosis and for inhibiting enterococcus infection.* U.S. Pat. Appl. Publ. (2005), US 20050209182.
6. McSwiggen, James; Chowrira, Bharat M.; Haeberli, Peter. (Sirna Therapeutics, Inc., USA). *RNA interference-mediated inhibition of NOGO receptor gene expression using short interfering nucleic acid (siNA).* U.S. Pat. Appl. Publ. (2005), US 2005182008.
7. McSwiggen, James; Beigelman, Leonid; Haeberli, Peter; Usman, Nassim. (Sirna Therapeutics, Inc., USA). *RNA interference-mediated inhibition of Polycomb group protein EZH2 gene expression using short interfering nucleic acids.* U.S. Pat. Appl. Publ. (2005), US 2005159382.
8. McSwiggen, James; Haeberli, Peter; Beigelman, Leonid. (Sirna Therapeutics, Inc., USA). *RNA interference-mediated treatment of Parkinson disease using short interfering nucleic acids.* U.S. Pat. Appl. Publ. (2005), US 2005137155.
9. McSwiggen, James; Beigelman, Leonid; Haeberli, Peter. (Sirna Therapeutics, Inc., USA). *RNA interference-mediated inhibition of G72 and D-amino acid oxidase gene expression using short interfering nucleic acids.* U.S. Pat. Appl. Publ. (2005), US 2005136436.
10. Haeberli, Peter; McSwiggen, James. (Sirna Therapeutics, Inc., USA). *RNA interference-mediated inhibition of Fas and FasL gene expression using short interfering nucleic acid.* U.S. Pat. Appl. Publ. (2005), US 2005119212.
11. McSwiggen, James; Chowrira, Bharat; Beigelman, Leonid; Macejak, Dennis; Zinnen, Shawn; Pavco, Pamela; Haeberli, Peter; Morrissey, David; Fosnaugh, Kathy; Jamison, Sharon; Usman, Nassim; Thompson, James; Vargeese, Chandra; Wang, Weimin; Chen, Tongqian; Vaish, Narendra. (Sirna Therapeutics, Inc., USA). *RNA interference-mediated inhibition of gene expression using chemically modified short interfering nucleic acids.* U.S. Pat. Appl. Publ. (2005), US 2005020525.
12. Vargeese, Chandra; Wang, Weimin; Chen, Tongqian; Sweedler, David; Haeberli, Peter. (Sirna Therapeutics, Inc., USA). *Polycationic compositions for cellular delivery of polynucleotides.* PCT Int. Appl. (2005), WO 2005007854.
13. Vargeese, Chandra; Haeberli, Peter; Wang, Weimin; Chen, Tongqian. (Sirna Therapeutics, Inc.,

- USA). ***Branched compounds containing bioactive molecules and targeting moieties for cellular delivery.*** U.S. Pat. Appl. Publ. (2004), US 2004249178.
14. McSwiggen, James; Beigelman, Leonid; Usman, Nassim; Haeberli, Peter; Chowrira, Bharat; Polisky, Barry. (Sirna Therapeutics, Inc., USA). ***RNA interference mediated inhibition of MAP kinase gene expression using short interfering nucleic acid (siNA).*** PCT Int. Appl. (2004), WO 2004097020.
 15. McSwiggen, James; Haeberli, Peter; Chowrira, Bharat. (Sirna Therapeutics, Inc., USA). ***RNA interference mediated treatment of Parkinson disease using short interfering nucleic acid (siNA).*** U.S. Pat. Appl. Publ. (2004), US 2004219671.
 16. McSwiggen, James; Bharat, Chowrira; Haeberli, Peter. (Sirna Therapeutics, Inc., USA). ***RNA interference-mediated inhibition of severe acute respiratory syndrome virus gene expression using siRNA.*** PCT Int. Appl. (2004), WO 2004092383.
 17. McSwiggen, James; Chowrira, Bharat; Beigelman, Leonid; Macejak, Dennis; Zinnen, Shawn; Pavco, Pamela; Haeberli, Peter; Morrissey, David; Fosnaugh, Kathy; Jamison, Sharon; Usman, Nassim; Thompson, James; Vargeese, Chandra; Wang, Weimin; Chen, Tongqian; Vaish, Narendra. (USA). ***RNA interference-mediated inhibition of gene expression using chemically modified short interfering nucleic acids.*** U.S. Pat. Appl. Publ. (2004), US 2004192626.
 18. Vargeese, Chandra; Haeberli, Peter; Wang, Weimin; Chen, Tongqian. (Ribozyme Pharmaceuticals, Inc., USA). ***Branched compounds containing bioactive molecules and targeting moieties for cellular delivery.*** U.S. Pat. Appl. Publ. (2004), US 2004110296.
 19. Morrissey, David; Haeberli, Peter. (Sirna Therapeutics, Inc., USA). ***Nucleic acid mediated inhibition of enterococcus infection and cytolyisin toxin activity.*** PCT Int. Appl. (2003), WO 2003106476.
 20. Seiwert, Scott; Zinnen, Shawn; Usman, Nassim; McSwiggen, James; Vaish, Narendra; Haeberli, Peter; Chowrira, Bharat; Blatt, Lawrence; Jadhav, Vasant; Kossen, Karl. (Ribozyme Pharmaceuticals, Incorporated, USA; Sirna Therapeutics Inc.). ***Allosteric nucleic acid sensor molecules designed for detection of nucleic acid and protein targets.*** PCT Int. Appl. (2003), WO 2003089650.
 21. Blatt, Lawrence; McSwiggen, James; Chowrira, Bharat M.; Haeberli, Peter. (Ribozyme Pharmaceuticals, Inc., USA). ***Nucleic acid-based modulation of NOGO and NOGO receptor interactions and genes for treatment and/or diagnosis of associated diseases.*** U.S. Pat. Appl. Publ. (2003), US 2003203870.
 22. McSwiggen, James; Beigelman, Leonid; Usman, Nassim; Haeberli, Peter; Chowrira, Bharat. (Sirna Therapeutics, Inc., USA). ***RNA interference-mediated inhibition of MAP kinase gene expression using short interfering nucleic acids.*** PCT Int. Appl. (2003), WO 2003072590.
 23. McSwiggen, James; Beigelman, Leonid; Haeberli, Peter; Usman, Nassim. (Ribozyme Pharmaceuticals, Incorporated, USA; Sirna Therapeutics Inc.). ***RNA interference-mediated inhibition of polycomb group protein EZH2 gene expression using short interfering nucleic acids.*** PCT Int. Appl. (2003), WO 2003070887.
 24. McSwiggen, James; Beigelman, Leonid; Haeberli, Peter. (Ribozyme Pharmaceuticals, Inc., USA). ***RNA interference-mediated inhibition of G72 and D-amino acid oxidase gene expression using short interfering nucleic acids.*** PCT Int. Appl. (2003), WO 2003070743.
 25. Usman, Nassim; McSwiggen, James A.; Zinnen, Shawn; Seiwert, Scott; Haeberli, Peter; Chowrira, Bharat; Blatt, Lawrence; Vaish, Narendra K. (USA). ***Methods and kits containing nucleic acid-based enzymes for detection of single nucleotide polymorphisms in diagnosis of***

- diseases.* U.S. Pat. Appl. Publ. (2003), US 2003065155.
26. Usman, Nassim; McSwiggen, James A.; Zinnen, Shawn; Seiwert, Scott; Haeberli, Peter; Chowrira, Bharat; Blatt, Lawrence; Vaish, Narendra. (USA). ***Methods and kits containing nucleic acid-based enzymes for detection of single nucleotide polymorphisms in diagnosis of diseases.*** U.S. Pat. Appl. Publ. (2003), US 2003008295.
 27. Blatt, Lawrence; Chowrira, Bharat; Haeberli, Peter; McSwiggen, James; Fosnaugh, Kathy. (Ribozyme Pharmaceuticals, Incorporated, USA). ***Modulation of gene expression associated with inflammation, proliferation and neurite outgrowth using antisense and enzymic nucleic acid-based technologies.*** PCT Int. Appl. (2002), WO 2002081628.
 28. Beigelman, Leonid; Karpeisky, Alexander; Serebryany, Vladimir; Haeberli, Peter; Sweedler, David. (USA). ***Methods for synthesizing nucleosides, nucleoside derivatives and non-nucleoside phosphoramidites and succinates.*** U.S. Pat. Appl. Publ. (2002), US 2002150936.
 29. Thompson, James; Beigelman, Leonid; McSwiggen, James; Karpeisky, Alexander; Bellon, Laurent; Reynolds, Mark; Zwick, Michael; Jarvis, Thale; Woolf, Tod; Haeberli, Peter; Matulic-Adamic, Jasenka. (Sirna Therapeutics, Inc., USA). ***Nucleic acid molecules with novel chemical compositions capable of modulating gene expression.*** U.S. Pat. Appl. Publ. (2002), US 2002142980.
 30. Beigelman, Leonid; Karpeisky, Alexander; Serebryany, Vladimir; Haeberli, Peter; Sweedler, David. (Ribozyme Pharmaceuticals, Incorporated, USA). ***Methods for synthesizing nucleosides, nucleoside derivatives and non-nucleoside phosphoramidites and succinates.*** PCT Int. Appl. (2002), WO 2002018405.
 31. Usman, Nassim; McSwiggen, James A.; Zinnen, Shawn; Seiwert, Scott; Haeberli, Peter; Chowrira, Bharat; Blatt, Lawrence. (Ribozyme Pharmaceuticals, Inc., USA). ***Ligand-modulated ribozymes for detection of analytes by reporter group addition.*** PCT Int. Appl. (2001), WO 2001066721.
 32. Thompson, James D.; Beigelman, Leonid; McSwiggen, James A.; Karpeisky, Alexander; Bellon, Laurent; Reynolds, Mark; Zwick, Michael; Jarvis, Thale; Woolf, Tod; Haeberli, Peter; Matulic-Adamic, Jasenka. (Ribozyme Pharmaceuticals, Inc., USA). ***Chemically modified ribozymes, antisense- and triplex-forming oligonucleotides for modulation of gene expression and tumor inhibition.*** PCT Int. Appl. (1999), WO 9954459.
 33. Beigelman, Leonid; Sweedler, David; Haeberli, Peter; Karpeisky, Alexander. (Ribozyme Pharmaceuticals, Inc., USA). ***Regioselective preparation of 2'-O-methoxy purine nucleosides via methylation.*** U.S. (1999), US 5962675.
 34. Beigelman, Leonid; Matulic-Adamic, Jasenka; Karpeisky, Alex; Haeberli, Peter; Sweedler, David; Reynolds, Mark; Chaudhary, Nilabh; Min, John. (Ribozyme Pharmaceuticals, Incorporated, USA). ***Preparation of novel compositions for the delivery of negatively charged molecules.*** PCT Int. Appl. (1999), WO 9905094.
 35. Wincott, Francine; Usman, Nassim; Beigelman, Leonid; Haeberli, Peter; Matulic-Adamic, Jasenka; Karpeisky, Alexander; Sweedler, David; Jarvis, Thale; Drenzo, Anthony. (Ribozyme Pharmaceuticals, Inc., USA). ***Synthesis of methoxy nucleosides and their incorporation into RNA ribozymes.*** PCT Int. Appl. (1997), WO 9726270.